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Do Ores Grow Richer or Poorer, More or less Plentiful, in Depth—Or is there any Rule?

A great geologist, Sir Roderick Murchison in fact, once made an unfortunate remark, the effect of which has been felt ever since, though the opposition of what was intended. He was led to say, in the early fifties, that certain quartz veins in Victoria—they call them "reefs" down there—and their gold contents, would not be persistent in depth. He based his belief on mistaken theories as to the formation, with imperfect data to go on. Later, in spite of the warning, the miners did follow the veins down and have been doing so ever since, to over 2500 feet in some cases and over 2000 feet in many others, and with the best success. The saying was unlucky because proved to be wrong by the facts, and the mining world never got over it, and is still quoting it in disparagement of all geological science. A reaction set in that has made itself felt to this day, so that even now we find intelligent miners holding a belief that ores are likely to improve in amount and grade as they go down. This feeling shows itself in such statements as "the ore runs so and so, and they are only down so many feet," or "just wait till we get down a little farther," and so on. There is another reason for the idea, to be sure, based on the old ascension theory of vein filling.

But now comes another set who are just as positive that the reverse is true. This is probably only another reaction from the earlier one, due to the tendency of so many minds to always join the opposition party. They hold that as a general thing, that is, with enough percentage in its favor to form a working rule or to bet on, ores grow poorer and that there are less of them the deeper you mine.

There is just about as much foundation for one belief as the other. Statistics can be adduced in endless profusion, to support either side. There are all sorts of experiences that might be quoted in favor of one or the other. But it is not a subject capable of being reduced to a mathematical demonstration. You can't fairly take one set of occurrences, add them up, and weigh them against another set, unless they are all of a kind. If we remember rightly, it used to be one of the axioms of elementary arithmetic that it won't do to add, subtract, multiply or divide Henry's apples by George's marbles—or something to that effect. But this is just what the new crop of theorists are trying to do—average up incompatibles. They take a certain number of dissimilar mines or steeply inclined contacts and beds, of all sorts of ores and with all kinds of country rock, and find that they improve as they descend. Then another group equally diverse is found that grow poorer in depth. These are added up separately and then a balance is struck between the two groups. One of these new faddists claims to have the records of many hundreds of mines and thinks that he has by them established the diminution theory beyond doubt. But probably an equally earnest advocate of the opposition notion could scare up quite as many evidences for his side of the argument. It is noteworthy that in all such controversies it is easy to find excuse for explaining away or suppressing testimony adverse to our pet theories.

Now there is this much of sense in such discussion, that because we cannot see our way clear to at once establish a definite law, this is no reason why we should not keep on trying to find out. Something worth knowing may come of the effort, and it is always well to bring together many observations, to the end that some result, perhaps not the one sought, may be reached and a generalization be made good. Still, it is difficult to comprehend how anything of practical value is yet in sight in this direction—unless it is a mental achievement to get a negative result, and be able to say frankly "we don't know."

At present safe deductions about mines are very limited in number and only rough approximations in degree, besides being subject to numerous exceptions. We know that a big, strong "fissure vein" in homogeneous rock, say granite

for instance, can be counted on to extend downward farther than men can ever follow it in mining. If it is ore bearing at the top, it is likely to be so (though of course not necessarily persistently or regularly) below. In limited districts the experience in some mines holds fairly good for others yet to be opened and thrown light upon the chances; as for example the rich croppings, poor zone of "cap," then again the characteristic ore bodies of Gilpin county; and in other districts certain peculiarities are often found to prevail locally, though they may be dissimilar to the conditions obtaining in other camps. Or when it is certain that a group of mines are mere shrinkage cracks (gash veins) in one kind of rock which do not extend into the underlying rock, we can tell about where to expect bottom. Or again, in some districts, after the structural relations are understood, we can sometimes make a guess as to the most likely position in which to look for an ore body. Or, in regular veins, it may be that the ore chutes of a given district may have a general trend in one direction. Again, there is a well understood probability of change from surface oxidized ore to sulphurets, etc., below the range of atmospheric agencies or below that elusive and delusive line, the permanent water level; though even this does not always hold true, since some veins have free milling ores all the way down. And so on, to a limited extent, we can frame rough working rules of probability, which must be taken for what they are worth and not pushed too far.

But all this does not help us in respect to the question of better or worse, more or less, ore in depth. The fact is that there are very few mines, even the most regular veins, that have continuous ore bodies from top to bottom, and still fewer that show a steady progressive increase or decrease in quantity and quality of ore from above downward. The ore, that is, ore that will pay to be taken out, generally occurs in detached bunches, or in stringers, seams and chutes of all sorts of shape, size and direction, without much relation to position—except perhaps the influence of cross courses and feeders and change in character of wall rock. A glance at the vertical longitudinal section of any large and long operated mine will show by the worked-out stopes how irregular the distribution of pay ore is.

Theorists overlook one or two very pertinent considerations. One is that we never know, in the case of a mine on a strong vein, abandoned in depth because of failure to find paying ore, what might or might not have been found only a little farther down than the lowest level worked, had the miners kept on it longer or had there been enough bore-holes to test the ground. Usually a mine that has become unprofitable, after having made a good record in its upper levels, is prospected in depth until the reserve money and patience of the owners give out; and often it is some difficulty entirely apart from absence of ore that caused the stoppage—as encountering unmanageable flows of water, or the increased expense due to deep mining. It would be an interesting and curious sight if we were gifted with magic vision and could only see into the ground a little farther down than the point where exploration ceased. Now, if, in a good district where other deeper mines were doing well, the ore should give out say at the 200, or the 500-foot or even 1000-foot level, and there were no insuperable obstacle in the way, the owners would be very likely to gamble a little in sinking a few hundred feet deeper. But suppose the ore fails at, say, the 2000 or the 2500-foot level? Then the situation, from the business, not the geological, point of view, is entirely different. This will account for a good many mine histories.

Again, here is another consideration not usually taken into the account. What we see of a mineral vein is really only a mere fraction of its total depth, perhaps an absurdly small fraction, looking at the matter in a large sense. In depth we can go down only 3000 or 4000 feet or so, and while undoubtedly there is an end to it somewhere, it may be very many times (and in the case of wide, strong veins must be presumed to be) deeper

than that.

There is a like deficiency of knowledge about the top, that is the original upper portion. For many veins we know not only the geological age of the country rock but also approximately the geological date of the fracture and filling. After the vein was formed and the ore deposited, many thousands of feet may have been eroded off—as, for instance, in the Jurassic gold veins of California, from which veins and the inclosing rocks enormous masses of gravel, as much as 630 feet deep in places and extended over wide areas, now represent what has been taken away in the course of long ages. So that the present visible and workable deposit is but a slice of the whole affair, as originally existing. The croppings of today may be nowhere near the original top; and on the other hand there is for practical purposes no bottom. Is it not attempting too much to reason out hypotheses based on such meager premises?

There is another point worth bearing in mind. All veins, or other forms of deposits, do not get a fair show. Surface ore bodies are more easily found than deeper-lying ones and the latter, if they make no attractive indications at the surface may never be looked for. Thus for every unknown deep ore body there are, according to the doctrine of chances, several service ones found.

Richness at the croppings may result from a kind of natural concentration, the heavier ore minerals remaining in sight while the lighter gangue, decomposing, is washed and blown away; though if the ore minerals in decomposing became soluble, the reverse happens.

The late Mr. Job evidently had but scant confidence in arbitrary rules as to the occurrence of ore in depth, for he settled the whole question, to his own satisfaction at least, when he declared that "silver is in veins in the mountains and gold is where you find it." He may have been pessimistic as to the outcome of geological theory; though he was not as he has been sometimes wrongly supposed, the author of the much quoted adage that "you can't see into the ground any farther than you can strike a pick." But his remark has a savor of off hand horse-sense, to this day.—Mining Industry.

Correspondence of the Victoria Colonist from Fort Sheppard, B. C., says: "American mining men in this country complain bitterly of what they describe as the petty and unfair interpretation placed by the Dominion custom authorities upon the clause of the act providing for the free admission into Canada of 'mining machinery which is, at the time of its importation, of a class or kind not manufactured in Canada.' They claim that in spite of this provision, no such mining machinery can come in duty free.

They instance the special patent steel piping required for hydraulic working, carefully riveted and fixed to withstand great pressure, which is refused admission on the ground that piping 'somewhat similar is made in Canada, or that some portions of it, such as the rivets, are so made. These gentlemen appear inclined to assume that this is intended as a special discrimination against them and their manufacturers, forgetting that they are not the only users of such machinery in British Columbia nor the sole manufacturers in the world. The numerous Canadian companies operating by hydraulic works here and the heavy imports of mining machinery from the mother country are subjected to precisely the same treatment, without favor or affection. But it would seem that their is some ground for the complaint, and it is believed that all the custom officers in British Columbia are in favor of a more liberal interpretation. At present duties are levied upon all machinery coming in, and the question of a refund has to be thrashed out with the Ottawa office, causing delay and irritation.

I recommend Chamberlain's Pain Balm for rheumatism, lame back, sprains and swellings. There is no better liniment made. I have sold over 100 bottles of it this year and all were pleased who used it. J. F. Pierson, druggist, South Chicago, Ill. It is for sale by H. H. WATKINS, Druggist.

The Nicaragua Canal and the Cession of the Arid Lands.

PRESCOTT, ARIZ., April 5th, 1894.

There are now pending in the United States senate two bills—both of which will be reported favorably by the committee to which they have been referred. One provides for the issuance \$200,000,000 in bonds on the credit and faith of the nation to construct the Nicaragua canal. The other provides for the cession of 1,000,000 acres of desert land to each of the states and territories of the arid west.

In both measures Arizona has a direct and vital interest. If the proposed bonds are issued to build the Nicaragua canal, its citizens will have to bear their proportion of the debt created in addition to the burdens they already have, while the benefits of the canal will be enjoyed chiefly, if not solely, by the commercial classes of the Atlantic and Pacific coasts.

Under the bill providing for the cession of 1,000,000 acres of desert land to the territory comes a curse instead of a benefit.

If the lands are granted what has the territory gained?

Without money or credit to construct reservoirs or canals to reclaim the same the lands must lie idle and barren for some years to come, while the grant absolves forever the government from the duty of constructing the irrigating works that will make such lands habitable.

If the government can appropriate \$100,000,000 to construct a canal within its boundaries in the interest of the store keepers of the nation, it can with equal equity appropriate money to build canals within its own confines to create new homes for its citizens. If \$100,000,000 can thus be appropriated to promote the interests of commerce, at least some similar consideration can be shown agriculture, that is the very foundation of all commerce.

Arizona does not want any more land. What it wants is money to make habitable the land it already has.

Under the grant of February 18, 1881, the territory has already received title to over 45,000 acres of land—more than is cultivated in the entire Salt river valley—yet what benefit has it gained by it? Not one man in a thousand can even tell where these lands are located. They lie idle and unproductive, subject to the depredations of any trespasser. From the entire grant it is doubtful if the territory will ever derive a dollar's benefit.

In addition to these 45,000 acres of land, under the laws already enacted by congress, the territory will in the future receive title to nearly five millions of acres. To make this vast area of land of any value whatever will tax the wisdom and financial resources of the territory for some years to come.

Why, then, seek fresh and useless burdens?

If the United States, with its unlimited resources, cannot reclaim the arid lands of Arizona, can the territory hope to do it?

Every ten years there is added to the population of the United States from 12,000,000 to 15,000,000 souls. New homes must be provided for this enormous increase, and it is the duty of the nation to provide for them, not of a bankrupt territory or state. For the nation to shirk the duty of doing so, and place it on the citizens of Arizona and the rest of the arid west is unjust and cowardly, and this is exactly what the cession of the arid lands means.

Already the government has made one experiment of this kind, when it ceded

6,000,000 acres of swamp land to the different states and territories. How dismally the experiment failed is a matter of public notoriety. Of all the states and territories that received these grants not one has fulfilled the obligation to reclaim the lands entrusted to it in a manner to distinguish itself. The law granting them merely released the general government from the duty of reclaiming them, while the state to which they had been ceded found themselves financially unable to do so, yet among the states were Illinois, California, Indiana, Ohio and others among the richest in the union. In consequence 90 per cent. of the lands are in the same condition today as when the law was enacted.

There is but one way in which the arid lands of the west can ever be reclaimed in a proper manner, and that is by the general government. Outside of this policy there is no salvation for the arid west. It has been the policy of England in India, of France at home and in Algeria, of Italy, of Spain, of Egypt, of Chili, of Peru, of Argentina and of Australia, yet all the money which has been expended by any one of these nations in works of irrigation will not equal the expenditure of the United States under the river and harbor laws. The expenditures under this bill already amounts to over \$250,000,000, and each congress adds to it from \$18,000,000 to \$30,000,000 more. Under it the United States has built reservoirs and canals from which it never receives a penny in return. A constitution that will permit the building of canals and reservoirs in the east will permit the building of canals and reservoirs in the west. If the government can build canals in Alabama and Ohio it can build canals in Arizona and New Mexico.

To what the government has already constructed canals and at what cost can be seen from the following list of states, giving the amount of money actually expended to date in each canal building:

Alabama—Tennessee river canal	\$ 10,000
Florida—Peninsula canal	20,000
Illinois—Michigan and Mississippi and Hennepin canals	260,000
Indiana—Wabash river and Lake Erie canal	75,000
Ohio—Two and one-half sections of land on each side of every canal	
Iowa—Red Cedar river, Des Moines and Salt St. Marie canal	840,250
Kentucky—Lewisville and Portland canal	225,000
Ohio—Ohio river falls, Cumberland river, Rough river and Zanesville Taylorville canals	227,000
Louisiana—Clarenton and Outlet canal	150,000
Mississippi—Carondelet canal, 60 per cent from sale of all public land	100,000
Michigan—St. Clair and St. Mary's falls canal	1,946,250
and also grant of 300,000 acres to build Lake Superior canal	
New Jersey—Bergen Point canal	150,000
Oregon—Cascade canal	1,728,000
Pennsylvania—Monongahela canal	5,8,000
South Carolina—Santee and Dismal swamp canals	289,000
Tennessee—Tennessee river canal	260,000
Texas—Galveston and Brazos river canal	25,000
Virginia—Chesapeake and Ohio, Chesapeake and Delaware canals	250,000
Washington—Lake Union canal, Baker's bay canal	205,000
Wisconsin—5 per cent. of net sales of public lands, and for the Fox river Portage lake, Green bay and other canals	550,000

In the face of such a record there is but one position for Arizona to assume, and that is absolute hostility to any grant of arid lands, and maintenance of the principle that the government must reclaim the desert lands, and not shirk the duty of doing so. The question is one of vital importance to the territory—the most vital that has ever arisen in its history, and its press and people should unite as one man in support of the proposition that congress must and shall accept the responsibility of letting them lie idle and barren, while the national highways are crowded with a hungry and homeless multitude.—BUCKEY O'NEILL, in Graham County Bulletin.



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